NASA Facts

National Aeronautics and
Space Administration

John C. Stennis Space Center
Stennis Space Center, MS 39529-6000
(228) 688-3333

August 2006

PROPULSION TESTING

NASA Stennis Space Center's (SSC) propulsion test activities are conducted on one-of-a-kind national test facilities collectively valued at over $2 billion. SSC is America's largest rocket test complex and is surrounded by a 125,000-acre acoustical buffer zone, which is considered a national asset. State-of-the-art facilities at SSC include the A, B and E Test Complexes, designed for rocket propulsion testing that ranges from component to engine to stage level.

SSC was established as a national testing center for flight-certifying all first and second stages of the Saturn V "Moon Rocket" for the Apollo manned lunar landing program. SSC now tests and certifies the flight-worthiness of all space shuttle main engines (SSMEs) and Pratt & Whitney Rocketdyne's RS-68 engines, and serves as a developmental rocket engine component and subscale test facility for future generation rocket engines.

The SSC test stands provide test operations for the development of propulsion systems, engines, subsystems and components.

SSC is considered NASA's choice for rocket propulsion testing, with total responsibility for conducting and/or managing all NASA rocket engine testing, including facilities at the Marshall Space Flight Center in Alabama, the White Sands Test Facility in New Mexico and the Glenn Research Center's Plum Brook Station in Ohio. SSC works directly with the NASA Rocket Propulsion Test Management Board and the National Rocket Propulsion Test Alliance to provide test operations to a variety of customers including NASA, the Department of Defense, commercial entities and others for the development of propulsion systems, engines, subsystems and components.

The Test Stands
Three stands, A-1, A-2 and the dual B-1/B-2, were built in the early 1960s to test the first and second stages of the Apollo Saturn V rocket that safely transported Americans to the moon.

The A Test Complex consists of two single-position, vertical-firing test stands designated A-1 and A-2. Configurations for the A Test Complex test stands have consisted of full flight-stage and main propulsion systems, and single-engine testing at sea level and altitude simulation.

The B Test Complex consists of a dual-position, vertical, static-firing test stand designated the B-1/B-2 Test Stand. First stages of the Apollo Saturn V rocket were static fired in the B-2 test position for acceptance testing from 1967 to 1970. SSC presently leases the B-1 test position to Pratt & Whitney Rocketdyne for testing of the RS-68 engine.

The E Test Complex was constructed as a result of several national propulsion development programs in the late 1980s and early 1990s. The versatile, three-stand complex includes seven separate test cells capable of testing that involves ultra high-pressure gases and high-pressure, super-cold fluids.

The test stands are linked by a 7½-mile canal system used primarily for transporting liquid propellants. Additional features of the test complex include test control centers, data acquisition facilities, a large high-pressure gas facility, a high-pressure industrial water facility served by a 66-million gallon reservoir and an electrical generation plant.

A 250,000-pound-thrust hybrid rocket motor is tested on the E-1 Test Stand at SSC's E Test Complex.

The Moon Rockets and the Space Shuttle

The center conducted the first static test firing of the Apollo Saturn V second-stage prototype engine in April 1966, and less than a year later, began testing the first and second stages of the rocket. This testing led to one of humankind's most phenomenal achievements when, in July 1969, Americans landed on the moon.

The Apollo-era test stands were converted from the Apollo/Saturn V configuration to accommodate the SSMEs, and on May 19, 1975, the first test of an SSME took place. On April 12, 1981, the first space shuttle, Columbia, lifted off from the launch pad at Kennedy Space Center (KSC) in Florida, powered by engines tested at SSC.

Every SSME undergoes acceptance testing at SSC. The engine is installed vertically in one of the large test stands in the A Complex, where an acceptance test firing is performed. Once proven flight-worthy, the engine is transported to KSC for installation on an orbiter.

A vapor cloud billows from the flame deflector at the A-2 Test Stand during the millionth second firing of the Space Shuttle Main Engine.

On Jan. 21, 2004, a milestone in human spaceflight was achieved when the 1 millionth second of successful test and flight operations of an SSME took place on the A-2 Test Stand at SSC. The SSME tested during the millionth second of firing was a flight engine scheduled for launch on the first series of space shuttle flights after Return to Flight.

As part of the Vision for Space Exploration, NASA plans to use the space shuttle, powered by SSMEs tested at SSC, to help finish assembly of the International Space Station by 2010. To meet that goal, SSC is committed to rigorous testing, important to any flight program, to make sure today's SSMEs are safer, stronger and more reliable than ever.

For more information on Rocket Propulsion Testing at Stennis Space Center, access the Stennis Space Center home page on the World Wide Web at https://rockettest.ssc.nasa.gov/

FS-2006-08-00035-SSC